ABSTRACT:

This paper explores the design of Adaptive Model Predictive Control (AMPC) using Subspace State–space Model Identification (SMI) techniques for an activated sludge process. The implementation of SMI techniques in the adaptive sliding window control methods are discussed where the online subspace identification using Numerical State–space Subspace System Identification (N4SID) algorithm is proposed along with Model Predictive Control (MPC) design method. The online N4SID algorithm developed in this study makes use of the QR–updating where the combination of update and down date techniques enables sliding window adaptation. Here, at each time step, for the new experimental data added into R factor, the oldest data are removed. Also, the Singular Value Decomposition (SVD–based) strategy is proposed into Indirect AMPC (IAMPC) for the control increment input constrained nonlinear system. Several simulation studies for different control parameters in control/identification algorithm are performed. For the IAMPC control design, the computational times involved using an SVD approach shows less burdensome compared to Quadratic Programming (QP) method and such an interesting result is considered as one of the main contribution in this paper.